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Of SN 10/337,369

IN THE SPECIFICATION:

Page 1, after the subheading "Field of the Invention" and before the first full paragraph, please insert the following new paragraph:

This is a divisional of application Serial No. 10/337,369 filed January 7, 2003, now allowed, which in turn is a divisional of application Serial No. 09/660,447 filed September 12, 2000, now Patent No. 6,602,741.

Page 3, first full paragraph, please cancel and replace with the following:

It is generally thought that the dielectric layer of the conductive polymer used in the solid electrolytic capacitor is self-repaired by the change of the conductive polymer to insulating polymer as a result of the joule heat generated by the current flowing to the dielectric layer defect portion. Conventionally, the dielectric layer formed by anodization is thickened to achieve a solid electrolytic capacitor with high withstand voltage, using conductive polymer for the negative

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electrode conductive layer. In other words, the anodization voltage is often increased to thicken the dielectric layer. Another approach is the use of anionic compounds which have high dielectric layer repairing ability ability as dopants for in-situ formation of the negative electrode conductive layer consisting of conductive polymer.

Page 10, fourth full paragraph, please cancel and replace with the following:

Phosphoric acid or esters of phosphoric acid, phenol derivatives, nitro compounds, alkyl naphthalene sulfonic acid ~~ion~~ anion, fluorocarbon surface active agents, or fluorocarbon surface active agents and binders as additives allow a solid electrolytic capacitor with high withstand voltage to be achieved.

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Page 19, second full paragraph, please cancel and replace with the following:

Then, 10 g of methanol solution containing 40 weight % of iron ~~(II)~~ (III) salt of naphthalene sulfonic acid and 1.6 g of pyrrole monomer are mixed at minus 30 °C. The capacitor element kept at the same temperature is impregnated with the above mixed solution to laminate a poly-pyrrole layer on the conductive composition layer. The capacitor is evaluated after the polymerization residue is cleaned and dried. Table 1 shows the results.

Page 26, third full paragraph, cancel and replace with the following:

Then, 0.8 mol/l iron ~~(II)~~ (III) salt of naphthalene sulfonic acid and 1.6 mol/l 3,4-ethylene dioxy thiophene monomer are mixed with methanol to prepare a polymerization solution. The capacitor element is immersed in this polymerization solution for application, then heated at 50 °C for 30 minutes and at 90 °C for 30 minutes, and cleaned and dried to form the conductive polymer

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layer made of the poly (3,4-ethylene dioxy thiophene). The negative electrode conductive layer consisted of the conductive composition layer and conductive polymer layer is formed as described above.

Page 27, third full paragraph, cancel and replace with the following:

Then, the capacitor element is immersed in methanol solution at minus 30 °C containing 0.8 mol/l iron ~~(II)~~ (III) salt of naphthalene sulfonic acid and 1.4 mol/l pyrrole monomer, and then cleaned and dried to form the conductive polymer layer made of the poly-pyrrole. The negative electrode conductive layer consisted of the base layer and conductive polymer layer is thus formed. The capacitance and electrical breakdown voltage of this capacitor are evaluated in the same way as that in Example 15. Table 1 shows the results.

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Page 30, first full paragraph to third full paragraph,  
cancel and replace with the following:

Then, the conductive composition precursor is applied to the 4 mm x 3.3 mm portion of etched aluminum foil 1, and heated at 50 °C for 60 minutes and at 150 °C for 10 minutes to remove the medium and to form conductive composition layer 4 consisting of polyaniline and ~~tri-propyl~~ tri-isopropyl naphthalene sulfonic acid.

Next, conductive polymer layer 5 is formed on conductive composition layer 4 by chemical polymerization. First, monomer solution of 3,4-ethylene dioxy thiophene (EDOT) monomer is prepared. Oxidizing agent solution in which iron ~~(II)~~ (III) salt of naphthalene sulfonic acid is dissolved in methanol is prepared. Then, the monomer solution and oxidizing agent solution are mixed to prepare the mixed solution. Here, the mixed solution is prepared to achieve the concentration of 1.6 mol/l EDOT and 0.8 mol/l iron ~~(II)~~ (III) salt of naphthalene sulfonic acid. The portion of etched aluminum foil 1 where conductive composition layer 4 is formed is immersed in the mixed solution for 1 minute, and heated at 50°C for 30 minutes and at

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100°C for 30 minutes to form conductive polymer layer 5 on conductive composition layer 4 by chemical polymerization.

Page 32, first full paragraph, cancel and replace with the following:

How the conductive composition precursor is manufactured is described next. Aqueous dispersion composition containing about 0.4 weight % of colloidal poly (3,4-ethylene dioxy thiophene) particles is prepared in accordance with the method disclosed in Synthetic Metals (Elsevier Press), 85, pp 1397. Then, 0.01 mol/l tri-isopropyl naphthalene sulfonic acid and 0.5 weight % ~~aleexy~~ alkoxy silane as a binder are added to the above aqueous dispersion composition for manufacturing the conductive composition precursor. A solid electrolytic capacitor is manufactured in the same way as Example 24, and evaluated. Table 2 shows the results.

Page 32, fourth full paragraph, cancel and replace with the following:

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Then, the conductive polymer layer is formed by chemical polymerization, in the same way as Example 24 on the dielectric layer, using EDOT as monomer and iron ~~(II)~~ (III) salt of naphthalene sulfonic acid as an oxidizing agent.

Page 33, second full paragraph, cancel and replace with the following:

The surface of the etched aluminum foil is anodized in the same way as in Example 24 to form the dielectric layer. Then, the conductive polymer layer is formed by chemical polymerization, in the same way as in Example 24 on the dielectric layer, using EDOT as monomer and iron ~~(II)~~ (III) salt of naphthalene sulfonic acid as an oxidizing agent.

The paragraph bridging pages 33 and 34, cancel and replace with the following:

Tri-isopropyl naphthalene sulfonic acid anion used in Example 27 has high repairing ability, and thus no large current flows during re-anodization, preventing decomposition of the

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conductive polymer layer. Accordingly, the solid electrolytic capacitor with low leak current, without degrading the dissipation factor or impedance, ~~is obtained~~ is obtained .

Page 34, fourth full paragraph, cancel and replace with the following:

The above Examples also refer to the case of using iron ~~(II)~~ (III) salt of naphthalene sulfonic acid as an oxidizing agent having small volume anion. Other substances such as iron ~~(II)~~ (III) salt of benzene sulfonic acid, benzene di-sulfonic acid, ethyl benzene sulfonic acid, dodecyl benzene sulfonic acid, and para-toluene sulfonic acid are applicable. The present invention is thus not limited to types of compounds as long small volume anion is contained.

The paragraph bridging pages 34 and 35, cancel and replace with the following:

The above Examples refer to the use of EDOT as monomer and iron ~~(II)~~ (III) salt of naphthalene sulfonic acid as an oxidizing

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agent, and the conductive polymer layer is formed by chemical polymerization. However, other monomers and oxidizing agents are applicable. The present invention is thus not limited to types of monomers and oxidizing agents.

Page 35, third full paragraph, cancel and replace with the following:

As described above, the use of alkyl naphthalene sulfonic acids or their salts contained in the conductive composition layer suppresses a damage to the dielectric layer caused by small volume anion such as para-toluene sulfonic acid anion and naphthalene sulfonic acid anion. Accordingly, the solid electrolytic capacitor with low leak current and high heat and moisture resistance ~~is obtained~~ is obtained. When an oxidizing agent having small volume anion such as para-toluene sulfonic acid anion and naphthalene sulfonic acid anion is used, the solid electrolytic capacitor with high capacitance obtaining rate is obtained. Accordingly, the present invention has an advantageous effect of manufacturing the solid electrolytic capacitor with low

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leak current, high heat and moisture resistances, and high capacitance obtaining rate.

Page 42, fourth full paragraph, cancel and replace with the following:

The capacitor element is impregnated with methanol solution containing 1.9M ethylene di-oxy thiophene monomer and 1.1M iron ~~(II)~~ (III) salt of para-toluene sulfonic acid once and then heated at 45°C and 85°C for 1 hour each for in-situ polymerization of polyethylene dioxy thiophene. After polymerization, the capacitor element is rinsed with methanol and water to remove polymerization residue.

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Page 43, third full paragraph, cancel and replace with the following:

The capacitor element is immersed alternatively in the monomer solution containing 0.75M pyrrole monomer, 0.04M sodium salt of tri-isopropyl naphthalene sulfonic acid and 0.1 weight % Surflon S112; and the oxidizing agent solution containing 0.4M ~~ferrous~~ ferric sulfate and 0.1 weight % Surflon S12 for in-situ polymerization of polypyrrole. The conductive polymer is polymerized at room temperature for 1 hour.